Each semester contain one theory and one practical in each Semester. Each theory paper will be of 3 Hrs. duration and carry 80 marks. The internal assessment will carry 20 marks. The practical examination will be of at least 4 hours duration in one day and shall carry 50 marks. The following syllabi is prescribed on the basis of six lectures per week and 6 practical periods per batch per week. Each theory paper has been divided into 6 units.

B.Sc. II (Sem.-III)

Unit-I: Mathematical background and Elecrostatics

Gradient, divergence and curl of a vector fields and their physical significance, line surface and volume integral. Gauss divergence theorem, Stocks theorem. Work done on charge in electrostatic field, flux of electric field, force on moving charge, Lorentz force equation and definition of B. Ampere's force law, Ampere's Law and its applications.

Unit-II: Magnetostatics and Maxwell's Equations

Faraday's Law, Integral and differential form of faraday's law, displacement current and Maxwell's Equation, wave Equation satisfied by E and B. Plane electromagnetic wave in vacuum, Poynting vector and Poynting theorem.

Unit-III: Solid State Electronics Devices-I

Physics of semiconductors: Introduction to semiconductors; Charge carriers & electrical conduction through semiconductors ; Doping , extrinsic semiconductors ; Fermi level & energy level diagrams ; Drift current in semiconductor , mobility, conductivity ; Hall effect, Hall coefficient, Semiconductor diode & its biasing, LED, Varactor diode.

Unit-IV: Solid State Electronics Devices-II

Introduction to BJT; working of BJT; modes of operation; Current gains á and â, their relation; CB & CE characteristics; JFET- construction & working , characteristics of FET ; Basic concept of Difference amplifier, IC-OP AMP , electrical parameters of OP AMP, inverting & noninverting modes ; OP AMP as adder, subtractor, differentiator & integrator.

Unit-V: Special Theory of Relativity

Postulates of Special Theory of Relativity, Lorentz transformations, Length contraction, Time dilation, relativistic addition of velocities, relativity of mass, Einstein's Mass - energy relation, Numericals.

Unit-VI: Atmosphere and Geophysicss

Structure of earth – The crust, mantle, core. Part of the earth – As a planet; The Atmosphere, The lithosphere, The Hydrosphere Composition of Atmosphere Earthquakes – Causes, terminologies associated with earthquakes. Type of earthquakes scale of intensity, recording of earthquakes. Radiation in the atmosphere, Propagation of energy through vacuum, Intensity of radiation, Scattering, absorption and reflection of solar radiation by the atmosphere. Moisture and clouds: mechanism that produces clouds, Cloud produced by mixing and by cooling.

Reference Books:--

1. Solid state Electronics Devices- B.G.Streetman (PHI)
2. Electronics Devices & Circuits – A. Mottershead (PHI)
3. Integrated Electronics—J. Millman ; C.Halkias (TMH)
4. Electronics Devices & circuits – Sanjeev Gupta (Dhanpat Rai Pub.)
5. Electronics Devices & circuits-I & II – Godse & Bakshi (Tech.Pub. , Pune)
6. Solid State Devices & Electronics—Kamal Singh & S.P.Singh (S. Chand & Co.)
7. Electromagnetic theory and holography – satya parakash
8. A text book of geology – G.B. mahapatra
9. Engineering and general geology – parbin singh.
10. The atmosphere – Richard A. Anthes, Hans A. Panotsky, Jhon J. Cahir, Albert Rango.
11. Relativity—Goyal and Gupta
12. Text book of Physics --- V. K. Sewane
13. Elements of Special theory of relativity—S.P.Singh and M.K.Bagde
14. A course in Electromagnetic field by S.W.Anwane, B.P.B. Publication, New Delhi.

Practicals:

1. To determine characteristics of CB transistor
2. To determine characteristics of CE transistor
3. Measurement of magnetic field by Hall probe method
4. To study variation of gain of CE amplifier with load
5. To study Zener regulated power supply
6. To determine characteristics of FET
7. To study FET as a voltmeter
8. To study Weins bridge oscillator
9. To study phase shift oscillator
10. To study Wein's bridge oscillator
11. To study p-n diode as a rectifier
12. To determine characteristics of p-n junction.
13. Study of OP AMP as an inverting amplifier
14. Study of OP AMP as noninverting amplifier
15. Study of OP AMP as an adder
16. Study of OP AMP as subtractor
17. Study of OP AMP as differentiator
18. Study of OP AMP as an integrator
19. To determine characteristics of Phototransistor
20. Measurement of field strength its variation in a solenoid.

B.Sc.-II (Sem.-IV)

Unit-I: Geometrical optics and interference

Cardinal points of an optical system, equivalent focal length and power of coaxial lens system, Interference in thin films due to reflected and transmitted light, interference in wedge shaped thin film, Newton's ring by reflected light, measurement of wavelength of monochromatic light by Newton's, ring, determination of refractive index of liquid by Newton's rings.

Unit-II: Diffraction

Fresnel and Fraunhofer Diffraction, Fresnel half period zone, zone plate construction and theory. Double slit diffraction, Plane diffraction grating; construction and elementary theory, determination of wavelength of monochromatic light by using grating. Resolution of images, Rayleigh's criteria for resolution, R. P. of grating.

Unit-III: Polarization

Concept of polarization, optic axis, double refraction, polarization by double refraction, phase retardation plate: - Quarter wave plate, half wave plate, (Nicol prism-production and analysis of polarized light). Theory of production of elliptically and circularly polarized light, production and detection of elliptically and circularly polarized light. Half shade polarimeter, blue of the sky.

Unit-IV: Laser

Introduction to Maser, Absorption, spontaneous and stimulated emission, population inversion, pumping, characteristics of laser beam. Main components of laser system, three level and four level laser system. Ruby laser, He-Ne laser, semiconductor laser, application of laser. Holography-principle.

Unit V: Fiber optics

Introduction of fiber optics, total internal reflection, structure and classification of optical fiber. Propagation of light wave in an optical fiber, Acceptance angle and numerical aperture, dispersion, fiber losses, fiber optic communication. Advantages and Disadvantages of optic fibers, application of fiber optics.

Unit VI: Renewable Energy Sources

Introduction to various renewable energy sources – Solar energy, Wind energy, ocean energy-Waves & tides, geothermal energy, Hybrid Systems, Hydrogen energy systems, Fuel cells.

Solar energy - Solar radiations on earth - availability and seasonal variations, Solar constant, Spectral distribution, Measurement of solar radiation and sun shine.

Solar Energy Storage- Methods of storage, properties of storage materials. Principle of Solar Thermal Applications, Solar water heater, Solar concentrating collectors – Types, applications.

Solar Photovoltaic systems- Operating principle, Photovoltaic cell concepts, power of a solar cell and solar PV panel; Applications

REFFERENCE BOOKS:

1. Laser and non-linear optics – B B Laud.
2. Optoelectronics and fiber optics communication – C.K Sarkar, D.C. Sarkar.
3. An introduction to fiber optics – R. Allen Shotwell
4. Optics – Ajoy Ghatak.

5. Optical fiber Communication – John M. Senior
6. Principles of optics – B.K.Mathur
7. Optics and laser – V.K. Sewane
8. Optics and atomic physics – D.P.Khandelwal.
9. Non-Conventional Energy Sources, G. D. RAI (4th edition), Khanna Publishers, Delhi.
10. Solar Energy, S.P. Sukhatme (second edition), Tata Mc. Graw Hill Ltd, New Delhi.
11. Solar Energy Utilisation, G. D. RAI (5th edition), Khanna Publishers, Delhi.
12. Principles of Solar Energy - Kreith Kreider.
13. Renewable Energy – Bent Sarensen.

Practicals:

1. To determine the wavelength of monochromatic light by Newton's rings.
2. To verify the Brewster's law.
3. To determine the refractive indices for ordinary and extra-ordinary rays using double image prism.
4. To determine the Concentration of sugar solution by half shade polarimeter.
5. To determine the wavelength of monochromatic light by plane diffraction grating.
6. To find the number of lines per centimeter of the given grating.
7. To determine the resolving power of plane diffraction grating.
8. To determine the resolving power of telescope.
9. To determine the wavelength of laser light.
10. Determination of refractive index of a prism by spectrometer.
11. Determination of dispersive power of prism material
12. To determine the resolving power of prism.
13. Study of interference of light by bi-prism experiment and find the wavelength of sodium light.
14. To verify the law of Malus of plane polarized light.
15. Polar plots of solar panel.
16. Measurement of direct radiation using Pyrheliometer.
17. Measurement of global & diffuse radiation using pyranometer
18. Determination of solar constant.
19. To determine frequency and phase of signal using CRO.
20. To determine capacitance by Scherring bridge method.
21. To determine self-inductance by bridge rectifier method.
22. To determine frequency of AC mains by Sonometer.
23. To study and plot I-V characteristics of solar cell.
24. To study time constant of an RC circuit experimentally and verify the result theoretically.
25. Verification of Stefan's law of radiation by using an incandescent lamp as black body Radiator.
26. To study (a) Half-wave Rectifier and (b) Full-wave Bridge Rectifier and investigate the effect of C, L and p filters.